Tourism and trade in OECD countries. A dynamic heterogeneous panel data analysis

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Abstract

This paper studies the empirical link between international tourism and trade. We apply dynamic heterogeneous panel data techniques to analyse both long-term and short-term relationship for the case study of OECD countries. This link is studied by estimating the cointegration vector and analysing the short and long-run causality between variables. The analysis recognises that inbound tourism can promote international trade and also that international flow of goods requires and may encourage tourist arrivals and departures. The statistical significance of this relationship supports the presence of business opportunities due to the potential complementary relationship between tourism and trade. The results suggest a short-run relationship between tourism and trade, and that these variables are cointegrated.

Keywords: tourism flows, international trade, cointegration, causality, panel data

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1. Introduction

It is generally understood that countries which increase their international trade become more open and as a consequence travel more and vice versa. In recent years, there has been a growing interest for analysing the relationship between international trade and tourism. This literature proposes several explanations for the links between these variables.

On the one hand, the relationship whereby tourism affects trade can take several paths. For instance, the development of the tourism industry in the tourist destination will increase its imports, which will be reflected in the trade balance. Moreover, tourist visits generally provide information and may improve the image of the tourist destination as well as its products around the world and hence create new opportunities for trade. On the other hand, the causality nexus in the sense trade causes tourism can appear since business travels are required to begin and to maintain the international trade of goods and services. Furthermore, an increase of imports directed at satisfying tourists' needs can have a positive influence on their visits.

The analysis of the relationship between tourism and trade is also relevant for at least another two reasons. Firstly, recent research finds that trade and tourism have encouraged the economic development in many countries[1]. For that reason, the study of the potential complementary relationship between flows of goods and international tourism is of major interest, as it can promote economic growth. Secondly, this relationship reflects the importance of business strategies that capture the benefits from the complementarity between tourism and trade.

In the literature, several papers that analyse causality between goods and tourist flows such as Kulendran and Wilson (2000), Shan and Wilson (2001) and Khan et al (2005) can be found. These authors explore the relationship between trade and tourism for the case study of specific countries or regions and are mainly focused on time series analysis. However, there are no papers dealing with the short and long-run relationships between trade and tourism using a cointegrating panel data approach. Following Pesaran et al. (1999)'s dynamic heterogeneous panel data methodology, in this paper the empirical relationship between tourism and trade for the case study of the OECD countries is explored. In this sense, a cointegration vector for the OECD countries is estimated and causality is analysed.

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[1] See, for instance, Ahmed and Kwan (1991), Kwan and Cotsomotis (1991), Marin (1992), Jin (1995) and Thornton (1997) for the relationship between trade and growth. Balaguer and Cantavella-Jordá (2002), Oh (2005), Nowak et al (2007) and Lee and Chang (2008) analyse the effect of tourism on economic development.

Related to this framework, there are some papers that study causality between variables in a heterogeneous panel data context. For instance, Funk and Strauss (2000) investigate the long-run relationship between productivity and capital. The authors carry out panel cointegration techniques showing that there exists a long-run relationship between both variables. Moreover, dynamic ordinary least squares (DOLS) and fully-modified OLS (FMOLS) estimates a causal nexus between these variables. Maeso-Fernandez et al (2004) analyse cointegration and causality in dynamic heterogeneous panel models. By using pooled mean group (PMG), DOLS and FMOLS estimates, these authors analyse the long-run relationship between exchange rate gap and per capita income.

Our paper contributes to the literature in two ways. First, the causality between trade and tourism is studied in a general perspective for a group of countries instead of focusing on a specific region or product. Second, dynamic heterogeneous panel cointegration techniques are applied to study the short and long-run causal nexus between trade and tourism variables.

The paper is organised as follows. In Section 2 the literature and the reasons for the reciprocal relationship are reviewed. Section 3 presents the analysis for OECD countries, where the presence of unit roots are tested, the cointegration vector is estimated and the causality between variables is analysed. Finally in the last section some conclusions are drawn.

2. Tourism and trade

Recent empirical research centres on the relationship between international tourism and trade. After a review of the literature, some of the reasons explaining the relationship between trade and tourism can be found.

Focusing our attention on the relationship whereby tourism can promote trade, some reasons which may support this nexus are presented. Concentrating on business trips, these are required to begin and to maintain the international trade of goods and services. Therefore, successful business trips directly promote a flow of exports and/or imports in subsequent periods. With respect to leisure visitors, they may identify business opportunities that could lead to international transactions in following periods. Moreover, tourists may consume goods and services that are not produced in the tourist destination and as a consequence require to be imported. The latter reason is a direct effect that can be illustrated by any international trade model in which consumers are allowed to consume abroad. Indeed the volume of trade is affected by both the shift of consumption abroad and the change in the consumption pattern in the destination with respect to the one in the country of origin (Santana et al, 2007a).

Related to the opposite relationship, i.e., trade promotes tourism, it can also be provided several explanations for this link. First, international trade not only needs but also influences business trips. Second, transactions between countries may create interest among consumers about the source countries and stimulate international visits. Third, international trade requires good basic facilities, services, and infrastructure such as transportation and communication systems that are also necessary for tourism activity to function. Fourth, intense international trade between countries increases the availability of products for visitors. This trade allows them to find, for instance, goods that they usually consume in their countries of origin.

What is more, the relationship where trade causes tourism is encouraged by repeated visits and pleasure visits of friends and relatives getting information about a destination country[2]. In spite of the evidence that trade may promote tourism, according to Lim (1997) business travel is one of the most frequently omitted variables when the determinants of tourist demand are analysed.

The literature testing the empirical one-way or two-way link between tourism and trade can be organized into three groups. First, some papers have focused specifically on the empirical analysis of this relationship. The results suggest empirical evidence in favour of a bilateral relationship between these flows. For instance, Kulendran and Wilson (2000) study the long-run relationship between international trade and tourism for the case study of Australia. By using cointegration techniques, they find support for a bilateral connection between both flows. Similarly, Khan et al (2005) analyse the empirical link between trade and tourism using Singapore data. Their results suggest a strong relationship for the case of business visits and imports. Finally, Shan and Wilson (2001) apply Granger no-causality techniques for the case of China. The authors identify the direction of the nexus between finding a two-way relationship between trade and tourism.

The second group of papers estimates models for tourist demand where international trade is considered as an additional regressor. Chul et al (1995), Goh and Law (2003), Eilat

[2] Ledesma et al (2001, 2005) argue that tourism markets are characterized by asymmetrical information. Therefore repeated visit may be a consequence of adverse selection problems. Furthermore, the relevance of previous visits and relatives and friends as sources of information about the destination is empirically proved.

and Einav (2004) and Santana et al (2009) find that international trade is a relevant variable to explain tourist demand and hence find a relationship in the sense “international trade causes tourism”. Turner and Witt (2001) also analyse tourist demand and find that international trade is one of the main determinants for business trips.

Finally, the third group of papers studies the relationship between trade and tourism for specific products or regions by using disaggregated data. The results obtained by Aradhyula and Tronstad (2003) indicate that there is a role for government agencies to play in overcoming imperfect information related to trade opportunities through facilitating exploratory business venture and tourist visits. Easton (1998) studies the case of Canadian trade and tourism, obtaining a relationship of substitutability of Canadian exports for tourist excursions to Canada. For its part, Fischer and Gil-Alana (2005) focus on the case of German imports of Spanish wines, finding that tourism promotes imports.

In summary, although several papers propose reasons and provide evidence supporting a relationship between trade and tourism, these papers focus their analysis for a specific country or product and they mainly use time series techniques. As mentioned above, there are no papers that study this relationship considering a panel data approach and hence incorporating a cross-sectional perspective.

3. Cointegration and causality in a panel error correction model

Tourism, which has expanded dramatically over the last thirty years, looks set to continue growing as the economy becomes more open and prosperous. Tourism is a key component of the services sector, which is growing in most OECD countries (30% of international trade in services in the OECD area). In terms of revenues, OECD countries generate about 70% of world tourism activity while these countries represent about 75% of world international trade.

In this section, the relationship between international exports, imports and total trade and tourist arrivals and departures among the OECD countries is investigated. With this aim, a dynamic heterogeneous panel data model is estimated where the short and long-run causality between trade and tourism is explored using Granger causality test and panel data cointegration techniques.

3.1. **Data**

With respect to trade flows (measured in US$), it is considered exports, imports, and total trade, as the sum of exports and imports, over the period 1980-2006. These variables require to be converted into real terms by using US GDP deflator. Related to tourism variable, tourist arrivals and departures over the same period are included. The choice of the sample period was mainly conditioned by the availability of tourism data for OECD countries. Trade flow data were collected from the International Monetary Fund (IMF) Trade Statistics[3] while tourism data and US GDP deflator were obtained from "World Development Indicators" of the World Bank. The descriptive statistics by countries are presented in Table 1.

[Table 1, here]

3.2. **Causality in panel cointegration framework**

It has been widely recognised that trade as well as tourism variables are mostly non-stationary. This fact implies that the variables must be modelled in a suitable econometric framework in order to avoid drawing conclusions based on spurious results. Accordingly, in this section we test for unit roots, estimate the long-run parameters and analyse causality in a dynamic panel data cointegration framework.

3.2.1. **Panel unit root tests**

Panel unit root tests are similar to unit root tests carried out on a single series. The ADF model for panel data may be expressed as:

$$\Delta y_{it} = \rho_i y_{it-1} + \sum_{j=1}^{p} \delta_i \Delta y_{it-j} + x'_{it}\beta + \varepsilon_{it}, \qquad (1)$$

where y_{it} is the series of interest being $i = 1,2,...,N$ cross-section units over periods $t = 1,2,...,T$, x_{it} represents a column vector of exogenous variables, including any fixed effects or individual trends, ρ_i is the mean-reversion coefficient, p is the lag length of the autoregressive process and ε_{it} a idiosyncratic disturbance assumed to be a mutually independent. If $|\rho_i| < 1$, y_{it} is said to be weakly (trend-) stationary, and if $\rho_i = 1$, then y_{it} presents a unit root.

[3] It is important to note that we are considering trade in goods, so trade data does not include trade in services.

Two natural assumptions may be made about ρ_i in the ADF model for panel data. Firstly, one can assume that the persistence parameters are common across countries, so that $\rho_i = \rho$ for all i. Using this assumption, the Breitung (2000) and Levin et al (2002) approaches (both testing for a null hypothesis of a unit root against the alternative of no unit root), and the Hadri (2000) one (which tests the null of no unit root against the alternative hypothesis of a unit root) can be applied. Secondly, one can allow ρ_i to be freely varying across units, allowing for individual unit root processes. This is the case of ADF and PP tests proposed by Maddala and Wu (1999) and Choi (2001) and IPS test proposed by Im et al (2003). The three of them test the null hypothesis of a unit root against the alternative hypothesis of some individuals without unit roots. In general, the possible deterministic components employed are fixed effects, and individual effects and individual trend.

Table 2 summarises the results of these six tests by using EViews 6.0. The statistical properties of each variable are studied individually and some classic methods to investigate whether the series are stationary I(0) or non-stationary I(1) are applied. As can be observed all the variables present a unit root. This result implies that all series are integrated of the same order, and hence the cointegration between variables can be studied.

[Table 2, here]

3.2.2. **Dynamic estimation: The error correction model**

A particular way to estimate the long-run parameters and the speed of adjustment to the long-run equilibrium (or error correction term, thereafter EC), when the variables are integrated is the dynamic panel data framework proposed by Pesaran et al. (1999). This approach is modelled as an autoregressive distributed lag model (ARDL). The classic specification for two variables, y_{it} and x_{it}, in our case trade and tourism, can be written as:

$$y_{it} = \mu_i + \sum_{j=0}^{p} \lambda_{ij} y_{it-j} + \sum_{j=0}^{q} \delta_{ij} x_{it-j} + v_{ij} \qquad (2)$$

where μ_i are fixed-effects, and p and q are the autoregressive and distributed polynomial lags, respectively. Also, a trend and seasonal dummies could be included in the ARDL(p,q) expression.

The EC panel data model, which is a re-parametrization of the equation (2), can be defined as the following general expression:

$$\Delta y_{it} = \phi_{1i} y_{it-1} + \beta_{1i} x_{it} + \sum_{j=1}^{p_i} \alpha_{1,ij} \Delta y_{it-j} + \sum_{j=1}^{q_i} \beta_{1,ij} \Delta x_{it-j} + \nu_{1i} + \vartheta_{1i} t + u_{1,it} \qquad (3)$$

where $i = 1 \ldots N$ indicate countries, $t = 1, \ldots, T_i$ is the sample period for each i-th group, y_{it} and x_{it} are I(1) variables, ϕ_{1i} is the error correction coefficient for i-th group, β_{1i} is the long-run parameter for i-th group, p_i and q_i are the lag length of the autoregressive distributed lag model for i-th group, $\alpha_{1,ij}$ and the row vector $\beta_{1,ij}$ represent the country-specific coefficients of the short-term dynamics, ν_{1i} and ϑ_{1i} represent the country-specific intercepts and time trend parameters respectively, and $u_{1,it}$ is an iid innovation.

A similar equation can be derived for Δx_{it}:

$$\Delta x_{it} = \phi_{2i} x_{it-1} + \beta_{2i} y_{it} + \sum_{j=1}^{p} \alpha_{2,ij} \Delta y_{it-j} + \sum_{j=1}^{q} \beta_{2,ij} \Delta x_{it-j} + \nu_{2i} + \vartheta_{2i} t + u_{2,it} \qquad (4)$$

with $u_{2,it}$ as iid error term, uncorrelated with $u_{1,it}$ and ϕ_{1i} and ϕ_{2i} denote speeds of adjustment. According to Engle and Granger (1987), the existence of cointegration implies a causality between the set of variables as expressed by $|\phi_{1i}| + |\phi_{2i}| > 0$.

Therefore, if cointegration between y_{it} and x_{it} exists, an error correction term is required to test Granger causality, and hence cointegration can be viewed as an indirect test of long-run causality.

Pesaran et al. (1999) propose the estimation of (3) and (4) by the mean-group (MG, where N separate regressions are estimated and the coefficients means are calculated) and the pooled mean-group estimators (PMG, which constrains the long-run coefficients to be identical). This last estimator is an intermediate procedure between MG and the fixed or random effects estimators where the intercepts are allowed to differ across groups while all other coefficients and error variances are constrained to be the same. PMG approach allows us to estimate the common long-run coefficient without making the less plausible assumption of identical dynamics in every country.

More specifically, equations (3) and (4) are estimated using the maximum likelihood procedure to get the PMG estimator. Moreover, these regressions are carried out with individual specific β_{1i} or β_{2i}, respectively, which are then averaged over N to obtain a mean-group estimator (MG) and this is the natural background to test for the presence of slope homogeneity based on a Hausman test[4].

Equations (3) and (4) allow us to test different hypotheses by using MG and PMG estimators, by assuming that all parameters are equals for the different groups and $p_i = q_i \equiv p$. These hypotheses can be defined as follows:

(i) The first hypothesis is related to cointegration where the null-hypothesis is $H_0 : \phi_1 = 0$ and a Wald test distributed as a chi square with one degree of freedom (χ_1^2), where one is the number of restrictions under the null hypothesis, is used. The rejection of the null hypothesis indicates that both variables are cointegrated. In a VECM framework, Sims et al (1990) interpret this hypothesis as long-run neutrality, while Corradi et al (1990) consider the rejection of the null hypothesis as the existence of long-run causality. Thus, this test analyses not only the presence of cointegration between the series but also indicates long-run causality.

(ii) The second hypothesis related to the significance of the long-run elasticity is $H_0 : \beta_1 = 0$. This null hypothesis implies that the elasticity between each tourist and trade variables is statistically significant. A Wald test distributed as a chi square with one degree of freedom (χ_1^2) is again employed to test this hypothesis.

(iii) The third hypothesis tests the presence of short-run causality. This is a test for the condition of zero adjustment for all countries. In this case, the null hypothesis is $H_0 : \beta_{1,.1} = ... = \beta_{1,.p} = 0$ assuming that parameters are equal for all groups, the Wald statistic is distributed as a χ_p^2, being p the lag length. The rejection of the null hypothesis implies the existence of short-run causality in the sense of Granger (1981).

[4] MG approach provides consistent estimates of the mean of the long-run slope coefficients (though it suffers from a lagged dependent variable bias for small T), but it is inefficient if slopes are homogeneous.

(iv) The fourth hypothesis that can be tested presence of long-run and short-run causality jointly. The null hypothesis is $H_0 : \beta_{1,.1} = ... = \beta_{1,.p} = \phi_1 = 0$ and in this case, the Wald statistic is distributed as a χ^2_{p+1}. The rejection of the null hypothesis implies that long-run, short-run causality or both exist.

A similar strategy can be derived for the equation (4). We use STATA 10.0 to obtain PMG and MG estimations. The results for MG and PMG estimators are reported in Tables 3, 4 and 5. These tables present the long-run and short-run parameters, the EC parameter and the coefficients of the lagged differences, Hausman test, and also appear t-statistic or Chi-square for ECM parameter enclosed in parenthesis and p-values enclosed in brackets.

With respect to the Hausman test, under the null hypothesis of homogeneity the pooled estimator is consistent and efficient, while it is inconsistent under the alternative hypothesis. Considering that the mean-group estimator is always consistent, a Hausman test is constructed to test for slope homogeneity.

PMG and MG are applied using an ARDL(3,3) specification for tourist arrivals and an ARDL(2,2) for tourist departures. These orders are selected by using Akaike information criteria and the results are robust with respect to the choice of the other lag structure.

[Tables 3, 4 and 5, here]

As can be observed in Tables 3, 4 and 5 the results of the Hausman test show that in all cases, apart from the relationship total trade causes tourist departures, the null hypothesis of homogeneity cannot be rejected and hence PMG estimates are efficient. For that reason, the results are discussed focusing on the PMG estimates.

Related to the hypothesis (i) which studies the cointegration between variables, the results presented in the three tables indicate that coefficients are significant in all cases suggesting that there exists a bilateral two-way long-run relationship between trade and tourism. The significantly negative coefficient of the adjustment term ϕ_1 on equation (3) and the significantly positive coefficient ϕ_2 on equation (4) imply mean reversion to a long-run equilibrium.

According to hypothesis (ii) the long-run coefficient β is significant in all cases according to the PMG estimate. Moreover, it always presents a positive sign suggesting that there exists a complementary relationship between trade and tourism. The significance of parameter β strengthens the evidence of cointegration among the variables[5].

Regarding to the hypothesis (iii), the short-run causal nexus between trade and tourism is studied. Table 3 shows the results associated with Granger tests for the relationship between exports and tourism variables. Specifically, at 10% of significance, there is a unidirectional causal nexus in the sense exports cause tourist arrivals and in the sense exports generate tourist departures. As can be observed in Table 4, the short-run causal analysis highlights that causation runs from tourist arrivals to imports while the relationship between imports and tourist departures cannot be found. According to Table 5, a unidirectional short-run relationship in the sense tourist arrivals cause trade seems to exist whereas the relationship between total trade and tourist departures is not confirmed.

Finally, related to the (iv) hypothesis where short and long-run causality are jointly tested, the null hypothesis is rejected in all cases for the PMG estimates suggesting that long-run, short-run causality or both exist.

Cointegration vector can also be estimated by using the fully modified OLS (FMOLS) derived by Pedroni (1996, 2000) and the dynamic OLS (DOLS) based panel estimator pooled along the within-dimension proposed by Kao and Chiang (2000). DOLS and FMOLS are carried out as a robustness analysis for estimating the long-run elasticity.

[Table 6, here]

Table 6 shows panel DOLS, FMOLS, PMG ad MG estimates of the long-run parameter. The parameter is significant and positive in almost all cases although there are differences in the results depending on the estimation method. PMG, MG, panel DOLS and FMOLS estimates reveal that a 1% increase in tourism arrivals significantly increases trade by 0.76–1.73%; whereas, a 1% increase in trade generates an 1.02 to 1.65% increase in tourist arrivals. Related to the relationship between trade and tourist departures, results show that a

[5] In a preliminary version of this research, cointegration was also studied by using different procedures in a panel data context. For instance, Pedroni (1999, 2004) and Kao (1999) based on Engle-Granger two-step (residual-based) cointegration tests, or Maddala and Wu (1999) using Fisher-type test based on an underlying Johansen methodology. The results confirm that all variables are cointegrated and they are available upon request.

1% increase in tourist departures significantly increases trade by around 1.02-1.22% while a 1% increase in trade generates a 0.59 to 1.58% increases in tourist departures. Similar conclusions can be obtained for the relationship between tourism and exports and imports.

Summarising, the empirical analysis provides evidence of a systematic relationship between tourism and trade variables and this results can be supported by the reasons pointed in Section 2. Specifically, variables seem to be cointegrated suggesting that exists a long-run relationship between trade and tourism flows and these relationship is positive implying complementarity between them. When the short-run nexus is tested, a relationship is confirmed for the case of exports cause tourist arrivals and departures. Moreover, results suggest that there exists a link that runs from tourist arrivals to imports and total trade. With respect to tourist departures, there is a unidirectional relationship in the sense imports promotes tourist departures.

4. Conclusions

In this paper we address the empirical relationship between tourism and trade from a dynamic heterogeneous panel data perspective. Traditionally, the analysis of the link between flows of goods and tourists has mainly been considered from a time-series perspective. In that sense, in the literature several papers that analyse this relationship for a specific country by using time series techniques can be found. However, in our analysis we present an additional perspective to the study of the relationship between trade and tourism by considering the analysis in a panel data context.

In the empirical analysis the causality between tourism and trade for a panel of OECD countries is studied. The long-term and short-term relationship may be analysed by estimating the cointegration vector and analysing the causality between variables. In that sense, the short and long-run causality could be tested.

The results suggest a long-term bidirectional relationship between tourism and trade and that this relationship is positive. This is an important implication of our analysis because means that it seems to exist a complementary link between trade and tourism. In other words, trade may promote tourism flows and vice versa which would allow to amplify the positive effects that trade and tourism have on countries´ income.

With respect to the short-run causal nexus, for the case of exports and tourism, it seems to exist a relationship that runs from exports to tourism. This result could be explained since international trade not only promotes business trips and intense international trade between countries increases the availability of products for visitors. For the case of imports and tourism flows causation runs only from tourist arrivals to imports. Also this result may be justified considering that many of the products that tourists consume are not produced in the tourist destination and needs to be imported. Moreover, the development of a tourist industry in a destination country will increase its imports. Finally, for the case of total trade and tourism, there seems to exist a causal nexus that run from tourist arrivals to total trade. As previously mentioned, this link can be explained for instance, business travel is required to begin and to maintain the international trade of goods and services. Again tourism promotes imports directed at satisfying visitors' needs.

The relevance of these results is clear since they may reflect business strategies to capture benefits from the complementarity between tourism and trade but mainly because this complementary relation between flows of goods and international tourism may promote economic growth.

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Table 1. Descriptive statistics

	Trade			Exports			Imports			Arrivals			Departures		
Country	Obs	Mean	Std.Dev.	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.
Australia	27	25.4237	0.3401	27	24.6587	0.3216	27	24.7964	0.3586	27	14.7414	0.6129	26	14.6804	0.4191
Austria	27	25.4055	0.4427	27	24.6366	0.4836	27	24.7810	0.4081	27	16.6563	0.1129	23	15.6081	0.4208
Belgium	27	26.3984	0.3866	27	25.7121	0.4143	27	25.6971	0.3604	27	15.4838	0.1928	25	15.6434	0.3226
Canada	27	26.6137	0.3326	27	25.9274	0.3354	27	25.9130	0.3322	27	16.5876	0.1573	26	16.6693	0.1899
Czech Republic	14	24.9430	0.5050	14	24.1684	0.5451	14	24.3228	0.4718	18	15.6663	0.3863	3	15.0547	0.0149
Denmark	27	25.1257	0.3156	27	24.4619	0.3487	27	24.4002	0.2851	26	14.6159	0.3265	21	15.2712	0.2043
Finland	27	24.8626	0.3235	27	24.2322	0.3588	27	24.0978	0.2950	24	14.4422	0.3381	25	14.6846	1.0971
France	27	26.9830	0.3153	27	26.2697	0.3297	27	26.3085	0.3045	27	17.7972	0.3336	27	16.5578	0.3492
Germany	27	27.4936	0.3495	27	26.8735	0.3600	27	26.7204	0.3405	27	16.5466	0.2032	25	17.7712	0.4417
Greece	27	24.2629	0.3498	27	23.0203	0.2577	27	23.9188	0.3893	27	16.0194	0.3714	13	14.1934	0.1934
Hungary	27	24.3749	0.5492	27	23.6428	0.5451	27	23.7165	0.5601	18	16.3157	0.4032	27	16.1359	0.4510
Iceland	27	22.0856	0.2967	27	21.3174	0.2545	27	21.4572	0.3402	26	12.3804	0.9551	17	11.9633	0.3047
Ireland	27	24.9183	0.6168	27	24.3231	0.7176	27	24.1011	0.5007	27	15.2299	0.4391	23	14.7212	0.6578
Italy	27	26.7159	0.3180	27	26.0110	0.3502	27	26.0314	0.2944	27	17.1979	0.2252	23	16.6748	0.3298
Japan	27	27.2109	0.2651	27	26.6281	0.2718	27	26.3895	0.2763	27	15.0080	0.4532	27	16.1550	0.5212
Korea, Rep.	27	25.9681	0.6125	27	25.2797	0.6440	27	25.2663	0.5867	27	14.8813	0.5903	27	14.5129	1.1594
Luxembourg	27	22.7090	0.9952	27	22.1476	0.8128	27	21.8057	1.2314	27	13.5376	0.1449	2	12.4761	0.0054
Mexico	27	25.6374	0.8268	27	24.9218	0.7568	27	24.9420	0.9383	27	16.6171	0.2167	26	15.7817	0.6202
Netherlands	27	26.5188	0.3841	27	25.8592	0.3956	27	25.7906	0.3725	27	15.6014	0.4511	27	16.1859	0.3512
New Zealand	27	23.9197	0.2752	27	23.2094	0.2556	27	23.2418	0.2986	27	13.9219	0.5501	27	13.6185	0.5148
Norway	27	25.0321	0.3092	27	24.4707	0.3782	27	24.1752	0.2323	27	14.6526	0.3654	26	14.1873	0.8675
Poland	27	24.7635	0.5650	27	23.9743	0.5169	27	24.1479	0.6235	27	15.8431	0.9789	25	16.8749	0.9725
Portugal	27	24.5311	0.5004	27	23.5751	0.5377	27	24.0426	0.4866	27	15.8341	0.4694	15	14.3852	1.6273
Slovak Republic	14	24.0871	0.4872	14	23.2943	0.5084	14	23.4830	0.4721	18	13.8065	0.3090	15	13.9826	2.0970
Spain	27	25.8932	0.5529	27	25.0201	0.5637	27	25.3502	0.5498	27	17.3914	0.3126	27	15.8350	0.5402
Sweden	27	25.5576	0.3203	27	24.9268	0.3509	27	24.7955	0.2907	27	14.5863	0.2533	25	15.8794	0.4746
Switzerland	27	25.6935	0.3030	27	24.9786	0.3331	27	25.0203	0.2761	26	16.0640	0.2609	21	16.0590	0.2779
Turkey	27	24.6661	0.6413	27	23.7081	0.6573	27	24.1777	0.6417	27	15.4294	0.9172	27	15.0210	0.5077
United Kingdom	27	26.9050	0.3002	27	26.1332	0.2772	27	26.2834	0.3228	27	16.7406	0.2772	27	17.4073	0.4444
United States	27	27.8892	0.3794	27	26.9843	0.3408	27	27.3657	0.4155	27	17.4303	0.3081	27	17.5928	0.3250

Table 2. Unit Root test

Variables	Levin-Lin-Chun (LLC)		Breitung	Hadri		Im-Pesaran-Shin (IPS)		ADF		PP	
	Fixed	**Trend**	**Trend**	**Fixed**	**Trend**	**Fixed**	**Trend**	**Fixed**	**Trend**	**Fixed**	**Trend**
Tourist Arrivals	4.14	2.35	0.16	18.55	7.00	8.52	1.01	15.21	62.84	13.30	51.20
	[1.00]	[0.99]	[0.56]	[0.00]	[0.00]	[1.00]	[0.84]	[1.00]	[0.38]	[1.00]	[0.78]
Tourist Departures	7.60	2.22	-0.83	15.51	10.95	7.46	1.57	27.54	60.84	25.63	44.00
	[1.00]	[0.99]	[0.20]	[0.00]	[0.00]	[1.00]	[0.94]	[1.00]	[0.31]	[1.00]	[0.88]
Trade	17.54	6.59	11.32	19.38	8.99	20.81	5.94	0.57	38.38	0.22	28.12
	[1.00]	[1.00]	[1.00]	[0.00]	[0.00]	[1.00]	[1.00]	[1.00]	[0.99]	[1.00]	[1.00]
Exports	16.94	7.71	12.41	19.38	8.13	20.31	5.85	0.91	49.44	0.63	33.23
	[1.00]	[1.00]	[1.00]	[0.00]	[0.00]	[1.00]	[1.00]	[1.00]	[0.83]	[1.00]	[1.00]
Imports	16.89	6.73	10.51	18.88	9.05	19.31	4.90	0.25	39.68	0.29	27.56
	[1.00]	[1.00]	[1.00]	[0.00]	[0.00]	[1.00]	[1.00]	[1.00]	[0.98]	[1.00]	[1.00]

Note: Between brackets appear p-values.

Table 3: Panel estimation results from the PMG and MG estimators and Granger causality test for exports and tourism variables.

	Tourist arrivals					Tourist departures			
	PMG	MG	PMG	MG		PMG	MG	PMG	MG
Variables	**Total Exports**	**Total Exports**	**Tourist arrivals**	**Tourist arrivals**	**Variables**	**Total Exports**	**Total Exports**	**Tourist departures**	**Tourist departures**
Constant	2.2608	3.1369	-0.0613	1.2673	Constant	0.1392	3.4078	-0.3577	-8.4131
	(4.21)	(2.06)	(-0.67)	(1.00		(2.96)	(2.99)	(-3.52)	(-1.08)
ΔE_{t-1}	0.2265	0.3633	-0.1111	-0.1886	ΔE_{t-1}	0.0895	0.1189	-0.0286	0.0551
	(2.46)	(2.51)	(-1.47)	(-2.55)		(1.50)	(2.18)	(-0.26)	(0.69)
ΔE_{t-2}	0.0438	0.1343	-0.1428	-0.1470	ΔE_{t-2}	0.0170	0.0686	0.2365	0.4104
	(0.70)	(1.15)	(-1.34)	(-1.57)		(0.32)	(1.26)	(1.64)	(1.56)
ΔE_{t-3}	0.1244	0.1944	0.0590	0.0616					
	(2.24)	(1.97)	(0.41)	(0.44)					
ΔA_{t-1}	-0.0705	-0.1915	0.1236	0.1487	ΔD_{t-1}	-0.0604	-0.0719	0.0339	0.0635
	(-0.66)	(-2.14)	(1.73)	(2.40)		(-0.96)	(-1.16)	(0.51)	(0.72)
ΔA_{t-2}	-0.1401	-0.2475	-0.0174	0.0525	ΔD_{t-2}	-0.0304	-0.0247	-0.0422	-0.0279
	(-1.85)	(-3.17)	(-0.29)	(0.93)		(-0.67)	(-0.51)	(-1.03)	(-0.45)
ΔA_{t-3}	-0.1677	-0.3021	-0.0017	0.0826					
	(-2.07)	(-3.27)	(-0.03)	(1.15)					
y_{t-1} (*)	-0.2547	-0.4549	0.1845	0.2192	y_{t-1} (*)	-0.057	-0.2662	0.1486	0.5838
	(16.16	(24.70)	(6.66)	(7.24)		(6.66)	(14.52)	(25.00)	(2.22)
β	1.0399	0.5425	1.5843	1.7102	β	1.4738	0.7929	1.4057	0.3274
Ho:β=0	(40.5)	(1.03)	(49.17)	(2.6)	*Ho*:β=0	(12.82)	(1.86)	(14.71)	(0.80)
Hausman test	0.6500		0.0300		*Hausman test*	1.9900		2.6600	
	[0.42]		[0.87]			[0.16]		[0.10]	
χ^2_p	5.5900	17.9800	8.8700	13.3100	χ^2_p	1.0700	1.3500	4.5200	4.5300
	[0.13]	[0.00]	[0.03]	[0.00]		[0.59]	0.51	[0.10]	[0.10]
χ^2_{p+1}	17.2700	35.9600	23.3500	45.2700	χ^2_{p+1}	7.3200	17.8500	28.5400	4.5300
	[0.00]	[0.00]	[0.00]	[0.00]		[0.06]	0.00	[0.00]	[0.21]

Note: t-Student for the short-run coefficients and constant and chi-squared for the y_{t-1} and *Ho*:β=0 appear enclosed between parentheses and p-values appear enclosed between brackets. (*) Given that our causality analysis is bidirectional, the coefficient of variable y_{t-1} is reported when we study equation (5) and x_{t-1} if we study equation (6). Hence, the columns 4 and 5, and 9 and 10 represent the coefficients for x_{t-1}.

Table 4: Panel estimation results from the PMG and MG estimators and Granger causality test for imports and tourism variables.

	Tourist arrivals					Tourist departures			
	PMG	MG	PMG	MG		PMG	MG	PMG	MG
Variables	**Total Imports**	**Total Imports**	**Tourist arrivals**	**Tourist arrivals**	**Variables**	**Total Imports**	**Total Imports**	**Tourist departures**	**Tourist departures**
Constant	1.4294 (4.60)	3.5629 (2.62)	-0.6053 (-4.05)	0.2123 (0.22)	Constant	0.8230 (2.63)	4.4142 (3.61)	0.9620 (6.75)	-6.5263 (-1.16)
ΔI_{t-1}	0.2448 (6.27)	0.3412 (5.50)	-0.1014 (-1.14)	-0.1368 (-1.50)	ΔI_{t-1}	0.1288 (2.18)	0.2092 (4.91)	0.0406 (0.48)	0.0409 (0.53)
ΔI_{t-2}	-0.0559 (-1.53)	0.0494 (0.87)	-0.0350 (-0.61)	-0.0629 (-1.10)	ΔI_{t-2}	-0.0228 (-0.46)	0.0647 (1.02)	0.1893 (1.80)	0.1809 (1.41)
ΔI_{t-3}	0.0315 (1.07)	0.1327 (4.29)	-0.0423 (-1.21)	-0.0318 (-0.80)					
ΔA_{t-1}	-0.1459 (-1.37)	-0.2928 (-3.38)	0.0506 (0.86)	0.0755 (1.29)	ΔD_{t-1}	-0.0569 (-0.61)	-0.1142 (-1.94)	0.0677 (0.79)	0.0381 (0.44)
ΔA_{t-2}	-0.0241 (-0.28)	-0.1752 (-1.64)	-0.0034 (-0.07)	0.0404 (0.75)	ΔD_{t-2}	0.0011 (0.02)	0.0325 (0.59)	-0.1092 (-2.62)	-0.0805 (-1.74)
ΔA_{t-3}	-0.2165 (-2.85)	-0.2871 (-3.17)	-0.0588 (-1.14)	-0.0221 (-0.41)					
y_{t-1} (*)	-0.2157 (19.27)	-0.4394 (42.64)	0.1117 (16.48)	0.1556 (12.25)	y_{t-1} (*)	-0.1387 (6.40)	-0.3748 (25.50)	0.1138 (39.94)	0.488 (3.28)
β	1.1717	1.4699	1.2336	0.9707	β	1.2460	2.5702	2.0879	1.0640
Ho:β=0	(43.56)	(4.08)	(38.66)	(1.19)	*Ho*:β=0	(25.54)	(1.59)	(10.39)	(1.58)
Hausman test	0.57 [0.4494]		0.08 [0.7796]		*Hausman test*	0.44 [0.5057]		1.37 [0.2413]	
χ^2_p	8.12 [0.04]	15.11 [0.00]	2.41 [0.49]	3.26 [0.35]	χ^2_p	0.41 [0.81]	4.59 [0.10]	4.52 [0.10]	3.16 [0.20]
χ^2_{p+1}	28.08 [0.00]	55.72 [0.00]	16.5 [0.00]	15.64 [0.00]	χ^2_{p+1}	7.31 [0.06]	29.62 [0.00]	45.8 [0.00]	4.5 [0.21]

Note: t-Student for the short-run coefficients and constant and chi-squared for the y_{t-1} and *Ho*:β=0 appear enclosed between parentheses and p-values appear enclosed between brackets. (*) Given that our causality analysis is bidirectional, the coefficient of variable y_{t-1} is reported when we study equation (5) and x_{t-1} if we study equation (6). Hence, the columns 4 and 5, and 9 and 10 represent the coefficients for x_{t-1}.

Table 5: Panel estimation results from the PMG and MG estimators and Granger causality test for trade and tourism variables.

Tourist arrivals					Tourist departures				
	PMG	**MG**	**PMG**	**MG**		**PMG**	**MG**	**PMG**	**MG**
Variables	**Total Trade**	**Total Trade**	**Tourist arrivals**	**Tourist arrivals**	**Variables**	**Total Trade**	**Total Trade**	**Tourist departures**	**Tourist departures**
Constant	2.3155 (4.86)	7.2845 (1.56)	-0.4497 (-4.10)	0.9628 (0.59)	Constant	0.1390 (2.72)	4.1529 (3.37)	-1.1502 (-5.11)	-8.0257 (-1.17)
ΔT_{t-1}	0.2780 (7.38)	0.4277 (4.10)	-0.1691 (-2.21)	-0.2147 (-3.89)	ΔT_{t-1}	0.1048 (2.04)	0.1847 (3.41)	-0.0194 (-0.21)	0.0457 (0.52)
ΔT_{t-2}	0.0092 (0.22)	0.0957 (1.45)	-0.0470 (-0.78)	-0.0928 (-1.42)	ΔT_{t-2}	0.0319 (0.62)	0.1090 (1.80)	0.2020 (1.34)	0.3181 (1.58)
ΔT_{t-3}	0.0967 (2.41)	0.1613 (3.81)	-0.0492 (-0.92)	-0.0158 (-0.26)					
ΔA_{t-1}	-0.0917 (-0.94)	-0.2568 (-3.41)	0.0713 (1.24)	0.0795 (1.30)	ΔD_{t-1}	-0.0913 (-1.36)	-0.1355 (-1.79)	0.0823 (0.87)	0.0664 (0.74)
ΔA_{t-2}	-0.0988 (-1.19)	-0.2409 (-2.18)	-0.0238 (-0.45)	0.0267 (0.45)	ΔD_{t-2}	-0.0401 (-0.66)	-0.0059 (-0.11)	-0.0503 (-1.21)	-0.0516 (-1.01)
ΔA_{t-3}	-0.2044 (-2.63)	-0.2894 (-3.40)	-0.0277 (-0.57)	0.0386 (0.73)					
y_{t-1} (*)	-0.2362 (22.37)	-0.5636 (9.73)	0.1371 (22.37)	0.153 (4.58)	y_{t-1} (*)	-0.082 (7.02)	-0.3286 (20.52)	0.1838 (31.36)	0.5516 (2.89)
β *Ho:*β=0	1.0224 (33.27)	1.4533 (3.24)	1.4177 (39.63)	1.7288 (3.15)	β *Ho:*β=0	1.5772 (15.16)	0.5890 (1.99)	1.2219 (22.94)	-62.4246 (-0.99)
Hausman test	0.75 [0.3854]		0.23 [0.6286]		*Hausman test*	8.4 [0.0038]		0.47 [0.4938]	
χ^2_p	7.29 [0.06]	17.38 [0.00]	5.16 [0.16]	18.09 [0.00]	χ^2_p	1.9 [0.38]	3.52 [0.17]	2.09 [0.35]	3.43 [0.18]
χ^2_{p+1}	25.4 [0.00]	24.59 [0.00]	36.1 [0.00]	46.94 [0.00]	χ^2_{p+1}	7.12 [0.07]	22.7 [0.00]	35.04 [0.00]	3.85 [0.28]

Note: t-Student for the short-run coefficients and constant and chi-squared for the y_{t-1} and *Ho*:β=0 appear enclosed between parentheses and p-values appear enclosed between brackets. (*) Given that our causality analysis is bidirectional, the coefficient of variable y_{t-1} is reported when we study equation (5) and x_{t-1} if we study equation (6). Hence, the columns 4 and 5, and 9 and 10 represent the coefficients for x_{t-1}.

Table 6. Comparing different panel data estimates for long-run parameters

Methods	Arrivals vs. Exports		Arrivals vs. Imports		Arrivals vs. Total trade		Departures vs. Exports		Departures vs. Imports		Departures vs. Total trade	
	β	t-stat	β	t-stat	β	t-stat	β	t-stat	β	t-stat	β	t-stat
FMOLS	0.78	109.70	0.76	94.72	0.76	95.63	1.12	3.73	1.18	3.54	1.15	8.28
DOLS	0.77	246.87	0.8	313.40	0.76	143.51	1.06	714.62	0.96	331.68	1.02	1586.61
MG	1.71	2.60	0.97	1.19	1.73	3.15	0.33	0.80	1.06	1.58	(*)	
PMG	1.58	49.17	1.23	38.66	1.42	39.63	1.41	14.71	2.09	10.39	1.22	22.94
	Exports vs. Arrivals		**Imports vs. Arrivals**		**Total trade vs. Arrivals**		**Exports vs. Departures**		**Imports vs. Departures**		**Total trade vs. Departures**	
	β	t-stat	β	t-stat	β	t-stat	β	t-stat	β	t-stat	β	t-stat
FMOLS	1.29	62.72	1.32	10.64	1.31	4.48	0.69	62.72	0.70	63.44	0.70	65.66
DOLS	1.64	126.9	1.67	166.0	1.65	137.6	0.76	77.29	0.87	442.8	0.84	467.70
MG	0.54	1.03	1.47	4.08	1.45	3.24	0.79	1.86	2.57	1.59	0.59	1.99
PMG	1.04	40.50	1.17	43.56	1.02	33.27	1.47	12.82	1.25	25.54	1.58	15.16

Note: t-stat is the t-Student for the null hypothesis, $H_0 : \beta = 0$. This result is not presented because the estimate is inaccurate